



LAWRENCE  
LIVERMORE  
NATIONAL  
LABORATORY

# XTOD - XES Interface Control Document

John Trent

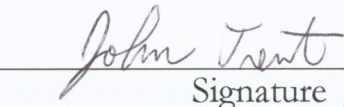
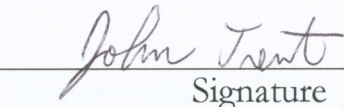
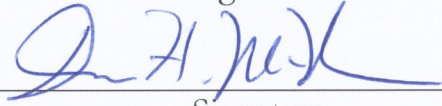
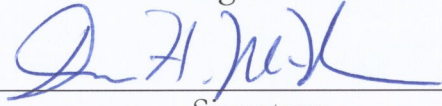


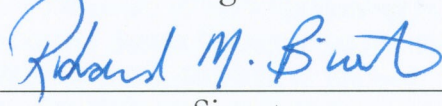
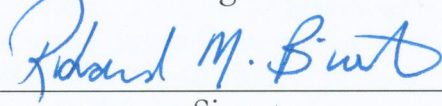
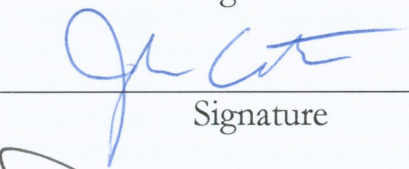
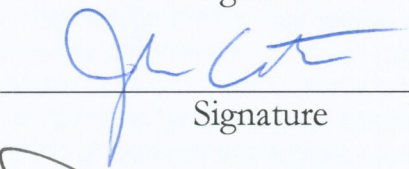
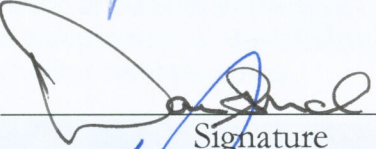
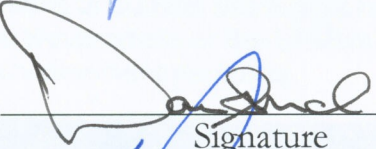
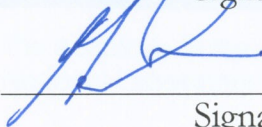
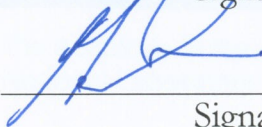
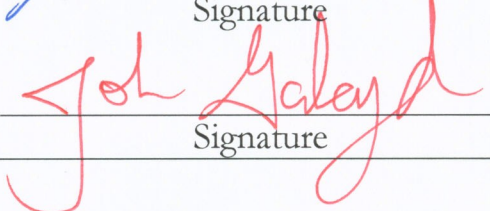
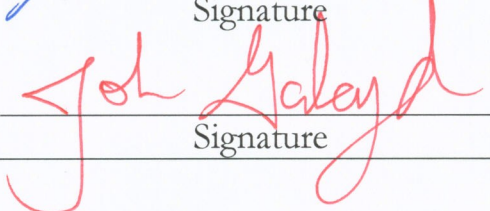
September 9, 2005

## **Disclaimer**

---

This document was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor the University of California nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or the University of California, and shall not be used for advertising or product endorsement purposes.

This work was performed under the auspices of the U.S. Department of Energy by University of California, Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

<b>LCLS Interface Control Document #</b>	<b>1.1 - 507</b>	<b>XTOD - XES</b>	<b>Revision 0</b>
<b>XTOD – XES Interface Control Document</b>			
John Trent Author			8/19/05 Date
Donn McMahon XTOD Deputy System Manager			8/17/05 Date
Stefan Moeller XES System Manager			9/12/05 Date
Richard Bionta XTOD System Manager			8/26/2005 Date
John Arthur Photon Beam System Physicist			9-12-05 Date
Darren Marsh Quality Assurance Manager			9/8/05 Date
Mark Reichenandter Chief Engineer			12 SEP 05 Date
John Galayda Project Director			13 SEP 05 Date



**Summary:** This document describes the interface between the LCLS XTOD System (WBS# 1.5) and the LCLS XES (WBS #1.6). The interface locations ranging from the beam dump to the far experimental hall are identified. Subsystems that connect at or cross the boundary are identified.

**Keywords:** Linac, XTOD, XES

**Key WBS Numbers:** 1.5, 1.6

### Change History Log

Rev Number	Revision Date	Sections Affected	Description of Change
000	8-19-2005	All	Initial Version

### Disclaimer

This document was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor the University of California nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or the University of California, and shall not be used for advertising or product endorsement purposes.

### Auspices Statement

This work was performed under the auspices of the U.S. Department of Energy by University of California, Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

## EXECUTIVE SUMMARY

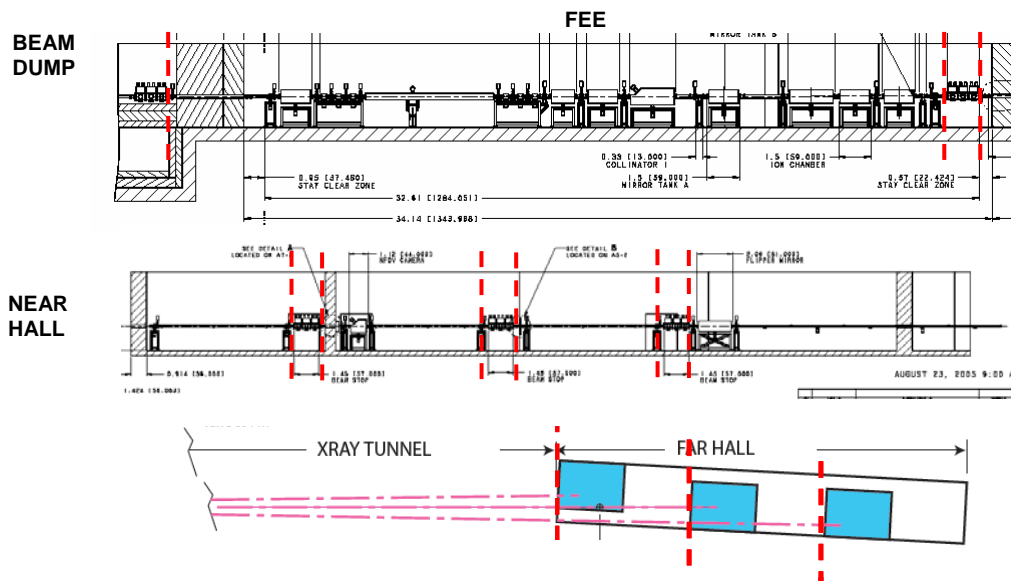
**1.1 Scope** Interface between LCLS XTOD and XES System. XTOD delivers x-rays to XES. Feedback and other control signals cross boundary originating from and delivered to either system.

## 1.2 Responsibilities

WBS	Represented by	Responsible for:
1.5	<i>R. Bionta</i>	Preparing and approving this ICD
1.6	<i>J. Arthur</i>	Supporting, maintaining, and approving this ICD

## 1.3 Interface Diagram

Interface planes in red



## 1.4 Interface Description

Heading	Check	Type	Location and Description
3.1	X	Mechanical	Bolted Connections
3.2		Fluid	
3.3	X	Vacuum	Interconnected HV System at Isolation Valves
3.4		Thermal	
3.5		RF	
3.6	X	Electrical	Control and Network Cabling.
3.7		Power	(AC, DC, Pulse, etc.)
3.8	X	Signal	PPS, Vacuum level, MPS, timing
3.9	X	Radiation	X-rays, Neutrons, Muons, Electrons
3.10		Environmental	
3.11	X	Other	Clear Aperture for Spontaneous Radiation

## 2.0 Applicable Documents

PRD# 1.1-303 LCLS Controls System Requirements  
PRD# 1.5-001 XTOD Physics Requirements  
PRD# 1.6-001 XES Physics Requirements

## 3.0 Interface Definition

The interfaces between XTOD and XES occur in the beam dump area (BD), front end enclosure (FEE), near experimental hall (NEH), x-ray tunnel (XRT), and far experimental hall (FEH). The physical component defining each interface is a Conflat style vacuum flange, which is part of or is near a vacuum valve. When the vacuum valve is open, a contiguous vacuum envelope crosses the system interface. X-rays cross the interface inside the beamline vacuum envelope. Controls and network cabling also cross the interface providing feedback, PPS, and vacuum control signals. General requirements for each system are detailed in PRD# 1.5-001 XTOD Physics Requirements and PRD# 1.6-001 “XES Physics Requirements”. Requirements for the controls system which crosses the interface are found in PRD# 1.1-303 “LCLS Controls System Requirements”.

XTOD is providing beamline from the downstream side of the PPS in the BD through the FEE, NEH, and tunnel to the upstream end of each PPS in the FEH.

XES is providing the Personnel Protection System units that will be placed at the downstream end of the BD, FEE, each of the three hutches in the NEH, and three which will be immediately upstream of each hutch of the FEH.

The mechanical interface planes are on the downstream side of the BD PPS, both sides of the PPS's in the FEE, NEH, and the upstream side of the FEH PPS's.

NEH Hutch 2 is reserved for XTOD diagnostic equipment.

NEH Hutches 1 and 3 are reserved for XES experiments. They will replace the beam pipes as they come online. XES will be responsible for that work.

In the commissioning phase, XTOD will place a diagnostics tank in FEH Hutch 2 to diagnose the FEL at that location.

**3.1 Mechanical Requirements** – The mechanical interfaces are 6” mating vacuum flange pairs. XTOD will provide at vacuum valve at or near each interface. XES will provide a bellows at each interface.

No loads will be transmitted through the interfaces.

The PPS's will be 1.45 m long or less.



### **3.2 Fluid Requirements – None**

**3.3 Vacuum Requirements** – High Vacuum is maintained inside the vacuum envelope on both sides of the interface. Controlled valves at the interface are interlocked to vacuum status on both sides of the interface. Maximum pressure at each interface is  $2 \times 10^{-6}$  Torr, which is consistent with standard LCLS vacuum requirements.

XES will provide all pumping required for the PPS's and for the hutches as experiments are installed.

### **3.4 Thermal Requirements – None**

### **3.5 RF Requirements – None.**

**3.6 Electrical Requirements** – As required, cabling carrying PPS, MPS, timing, and vacuum control signals cross the interface.

### **3.7 Power Requirements – None**

**3.8 Signal Requirements** – PPS, MPS, timing, and vacuum signals cross the interface.

**3.9 Radiation Requirements** – Linac system delivers x-rays to XTOD as described in documents 1.1-001 “Global Requirements Document” and PRD# 1.5-001 “XTOD Physics Requirements”.

### **3.10 Environmental Requirements – None**

**3.11 Other Requirements** – Clear aperture for the XTOD diagnostics must be maintained by both side of the interface. The size of clear aperture varies, growing in Z. It is approximately 7.2 cm wide and 3.6 cm tall at the end of the beam dump region. The PPS in the BD must not intrude on the clear aperture for XTOD diagnostics when the PPS is open.

**4.0 Verification** – Verification of all requirements to be performed during system commissioning. Performance goals for each system to be tested are described in the Physics Requirements Documents.

**5.0 Notes** – Design of global controls feedback and controls infrastructure to be managed and funded from WBS 1.1 LCLS Management and Integration.